NATIONAL AIRSPACE SYSTEM (NAS)

DoD NAS Equipment
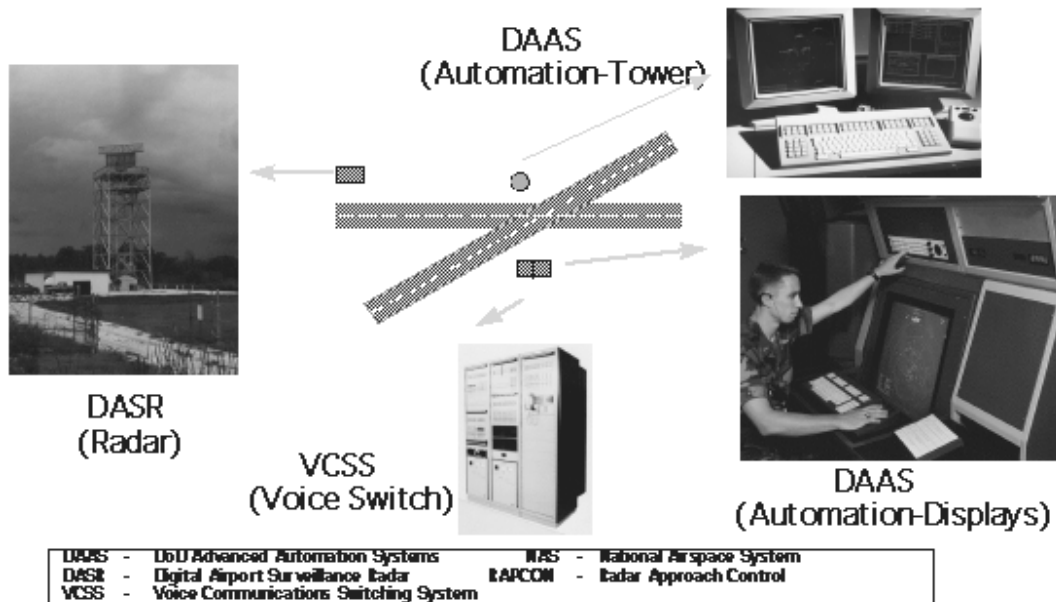
Air Force/FAA ACAT IC Program

Air Traffic Control and Landing System		
Total Number of Systems:	92 sites	
Total Program Cost (TY$):	$1021M	
Full-rate production:	2QFY01	

Prime Contractor

Raytheon Corp. (Radar/Automation)
Denro (Voice Switches)
Raytheon (Airspace Scheduling)

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The National Airspace System (NAS) program will replace three types of Air Traffic Control and Landing System (ATCALS) equipment used to support the Air Traffic Control's radar approach control mission. NAS includes voice switches, approach control and tower automation, and airport surveillance radars. The NAS program modernizes radar, voice networks, and automation functions within the ATCALS at 92 DoD sites. A total of 222 voice switching systems will be installed. The NAS program also includes the Military Airspace Management System: an off-line, one-of-a-kind, web site-based special use airspace scheduling and utilization tracking system accessed via the Internet.

The NAS modernization will enhance *precision engagement* through *technological innovations* that will allow DoD to keep pace with state-of-the-art digital radar-approach control equipment and improve scheduling of special use airspace to ensure wartime readiness.

BACKGROUND INFORMATION

The ATCALS systems to be replaced have two primary problems: (1) limited interoperability; and (2) excessive cost growth for operations and support. The Federal Aviation Administration (FAA) has undertaken a massive upgrade of the nation's air traffic control system infrastructure by systematically replacing analog systems with state-of-the-art digital technology. The new systems take advantage of the significantly increased capabilities of digital radar, computers, and data distribution networks. Most DoD systems are currently analog and will not easily or economically interface with new generation FAA equipment. Without the added capability, DoD will be unable to continue providing efficient and reliable service to all air traffic system users, military or civilian. Furthermore, DoD NAS cost and operational effectiveness analysis indicates that DoD will experience excessive operations and support costs if the DoD air traffic control equipment is not replaced.

The NAS portion of the ATCALS modernization program will upgrade DoD air traffic control radar approach control facilities to ensure compatibility with the FAA's air traffic control facilities. DoD NAS equipment must be fully interoperable with the FAA's modernization of analog equipment and capable of providing FAA-equivalent air traffic control services to civilian and military aircraft. When fully fielded, the DoD NAS program upgrade will include the following four programs:

- Voice Communications Switching System (VCSS) performs all control functions needed for air traffic control communications, including radio, intercom, and telephone access. VCSS will provide an interface to analog switch and distribution systems and interface with legal voice recorders in all recording transmissions.

- DoD Advanced Automation System (DAAS) will receive and process primary and secondary radar data, flight plan information, weather, airport environmental data, and administrative information (such as Notices to Airmen) required for operation of the local air traffic control facility.

- Digital Airport Surveillance Radar (DASR) consists of integrated primary and secondary radar subsystems and will provide highly accurate target data to the local air traffic control facilities. The DASR's digital data output is compatible with the FAA's radar network and the DAAS. The DASR will have improved target detection and accuracy, clutter rejection, aircraft identification accuracy, altitude data, and weather capability. The system will also provide search information under adverse conditions of ground clutter, weather, interference, and ground vehicular traffic.

- Military Airspace Management System (MAMS) will provide the ability to efficiently schedule, track, and document utilization of special use airspace in a non real-time manner, as well as interoperate with the FAA. Scheduling agencies will access the MAMS central web site using existing desktop computers with Internet access. MAMS is not used as a real-time scheduling or airspace control tool; there are no safety of flight issues associated with MAMS.

The FAA is the lead organization for VCSS and DAAS testing, with the Air Force serving as DoD lead for DASR testing and sole test agency for MAMS. DoD is working with the FAA through an interagency agreement for all VCSS, DAAS, and DASR test activities. The FAA and DoD are conducting a series of combined developmental tests and operational tests for VCSS, DAAS, and DASR. DoD is responsible for testing MAMS.

VCSS completed DoD operational testing in March 1999 and executed the full-rate production decision in November 1999.

MAMS completed operational testing in July 1998 and was placed in operational use in October 1998. MAMS is currently in the process of transitioning to the central facility at the Naval Air Warfare Center in Patuxent River, MD.

The NAS Milestone III decision scheduled for 2QFY01 will focus on full-rate production of DAAS and DASR. Operational testing of both systems is scheduled to occur during joint test in 3-4QFY00. Joint testing is required due to the fact that the majority of existing analog equipment will not interface with the newer hardware. LRIP quantities of up to 20 DAAS and DASR systems were approved by the Air Force to establish an initial production base for DoD. FAA purchases of identical equipment are made through the agency's own procurement channels, although on the same purchase contract.

TEST & EVALUATION ACTIVITY

DOT&E approved the VCSS Test Plan in July 1997. The FAA conducted VCSS developmental and operational testing throughout 1998. FAA operational testing at Santa Barbara, CA, and Colorado Springs, CO, supported the FAA's In-Service Decision (similar to a DoD full-rate production decision). Air Force personnel performed "over-the-shoulder" observations of the FAA's operational testing and used these reports as the basis for the DoD LRIP decision. Due to close coordination between the Air Force and FAA, no additional DoD-unique testing was required in addition to the FAA testing at Santa Barbara and Colorado Springs.

The FAA tested the VCSS for Y2K compliance in January 1998. Air Force personnel witnessed the testing and the data was used for DoD certification. Due to problems discovered during testing in April 1998, VCSS was partially certified as Y2K compliant. The four exceptions were addressed with a series of engineering changes. VCSS completed Y2K certification in August 1998.

AFOTEC conducted operational testing of the VCSS from February 14-March 12, 1999. Preliminary results indicated that VCSS did not meet some of its suitability requirements due to inter-related parts reliability, maintainability, depot-level support, spares provisioning, and technical documentation issues. Since the end of formal operational testing, the Air Force has taken steps to correct those deficiencies. AFOTEC and DOT&E reviewed and verified the corrective actions in field operations at Eglin AFB.

The FAA-led DAAS program successfully completed System Article Test (a system-level development test) at Eglin AFB on the Emergency Service Level software. The next test event, FAA's testing on the Full Service Level software, is underway and results are expected on schedule. DAAS Y2K certification is scheduled for December 1999. DoD completed DASR Y2K certification in May 1999.

DoD's combined developmental/operational testing on DAAS and DASR, conducted October-December 1999, supports LRIP decisions in January 2000. DAAS/DASR mission-level operational testing is scheduled for May-September 2000, to support a January 2001 full-rate production decision for both DAAS and DASR.

TEST & EVALUATION ASSESSMENT

DOT&E submitted its VCSS B-LRIP in November 1999. DOT&E concluded that VCSS operational testing of VCSS was adequate, and that VCSS is operationally effective and suitable. The conclusions are summarized below:

- VCSS is operationally effective. VCSS is fully interoperable with the FAA communications systems upgrade, and provides safe and expeditious control of air traffic in military controlled airspace. VCSS met all requirements to support air-to-ground, ground-to-ground, and intercom communications. VCSS was equally effective in providing legal voice interface recording for incident investigations. Communications were clear, and controllers rated the system very favorably for overall operations, human factors, and ease of use.

- VCSS is operationally suitable. VCSS was rated not operationally suitable at the conclusion of Multi-Service Operational Test and Evaluation (MOT&E) due to interrelated parts reliability, maintainability, depot-level support, spares provisioning, and technical documentation issues. DOT&E reviewed corrective actions taken since MOT&E, verified those corrective actions in field operations, and finds that those actions are adequate to rectify suitability shortcomings. These corrective actions, along with the high level of operational availability, inherent redundancy in the system, and the demonstrated ability of the Radar Approach Control and Control Tower to perform 100 percent of their operational missions from February-November 1999, led DOT&E to conclude that VCSS is operationally suitable.

The final report on DAAS systems acceptance testing of Emergency Service Level software has not been released. However, DOT&E's insight into the preliminary results indicate the Air Force has done an outstanding job and that Emergency Service Level performed well and will satisfy operational requirements.

The DAAS development and testing schedule has rapidly accelerated this year. The program no longer appears to be challenged by delays resulting from additional changes to the baseline requirements by the FAA and FAA controllers union. Previous changes to requirements were making it impossible to finish developmental testing and begin operational testing of the system. In some instances, problems were further complicated by the fact that controllers had been hesitant to accept newly developed control tower software and system interface procedures. The FAA appears to have resolved these issues. MOT&E is now scheduled to start in May 2000.

The DoD-managed DASR experienced a small delay after entering contractor on-site testing at Eglin AFB. Most of the deficiencies related to the system not meeting technical specifications; most have been corrected to allow government testing to begin. Combined developmental/operational testing began in December 1999, and is ongoing in preparation for MOT&E in May 2000.

The NAS TEMP update addressing remaining DAAS and DASR testing has received all but the Navy's final Service signatures. The TEMP and associated test plans are overdue to DOT&E and must be submitted for approval as soon as possible to avoid delays in the operational test schedule.

CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED

The FAA's operational testing of VCSS resembled DoD's developmental testing, and does not meet the rigor normally associated with DoD operational testing. Consequently, much of the data collected by FAA during its operational testing of VCSS could not be used to resolve DoD's operational test requirements, so additional testing was required in an "operationally realistic" environment. It is unlikely that the FAA will change its test approach, thus the situation will be similar for DAAS/DASR operational test events. DoD must continue to ensure robust, independent testing of DoD-unique requirements while using FAA test data as appropriate.

Successful implementation of DoD's combined DAAS/DASR test strategy depends heavily upon FAA's ability to execute its lead authority for DAAS. Since DoD plans to acquire and test concurrently with DAAS, any schedule changes for DAAS introduce risk and uncertainty into the DASR program, as well as significant uncertainty for the remaining NAS program. The key to a successful program is for all agencies to continue to closely ensure good communications and keep pace with changing issues. To mitigate this risk to DASR from a potential DAAS slip, DoD has developed a strategy to acquire and test DASR and DAAS programs in sequence, if necessary.